

In the outstanding Office Action, Claims 1-4, 7, 10 and 12 were rejected under 35 U.S.C. §103(a) as unpatentable over Kusunoki et al in view of Rama et al; and Claims 13-18, 20 and 22 were allowed.

Applicants thank the Examiner for the indication of allowable subject matter.

Claims 1-4, 7, 10 and 12 stand rejected under 35 U.S.C. §103(a) as unpatentable over Kusunoki et al in view of Rama et al. This rejection is respectfully traversed.

Independent Claims 1, 10 and 12 have been amended to recite that the claimed vaporizer method uses H₂O as an oxidizer. In more detail, the vaporizer method recited in Claims 1, 10 and 12 is a method of producing an inert gas containing a vaporized liquid substance, by for example, usually by introducing the inert gas into the liquid substance and causing the vaporized liquid substance to be contained in the inert gas. That is, the vaporizer method uses H₂O as an oxidizer as discussed in the application at page 31, lines 4-9. In other words, the liquid substance is H₂O, and independent Claims 1, 10 and 12 recite methods of producing an inert gas containing water vapor and forming a post oxide film on the exposed surface of a semiconductor substrate using the inert gas.

The outstanding Office Action recognizes Kusunoki et al fail to include a vapor method to help form a gate insulating film and relies on Rama et al as teaching a two-step process including a vapor technique to form oxynitride films. The outstanding Office Action also indicates it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the teachings of Kusunoki et al with those of Rama et al to incorporate a better method of obtaining a layer with superior qualities.

However, Applicants note the vaporizer method recited in independent Claims 1, 10 and 12 of the present invention differs from the vapor technique disclosed in Rama et al. In more detail, Rama et al merely describe in the second paragraph of the main body (see page

2882), "First, ~95Å of thermal oxide was grown at 950°C in an oxygen ambient then, the NO oxynitride films were grown by annealing this oxide in a diluted NO ambient at 950°C for 15, 28 or 60 minutes." Applicants note "diluted NO ambient" usually means diluting the concentration of NO gas using an inert gas such as nitrogen. This differs from the claimed invention which discloses a method of producing an inert gas containing a vaporized liquid substance or more specifically the vaporizer method using H₂O as an oxidizer.


Accordingly, in light of the above comments, it is respectfully submitted independent Claims 1, 10 and 12 and each of the claims depending therefrom are also allowable.

In addition, the Brief Summary of the Invention has been amended to correspond with the changes made in the claims. It is believed no new matter has been added.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully.

Respectfully submitted,

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IN THE SPECIFICATION

Please amend the specification to read as follows:

Please replace the paragraphs at page 6, lines 2-10, with the following text:

According to an aspect of the present invention, there is provided a semiconductor device manufacturing method comprising forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate; forming gate electrodes on the gate insulating film; removing the gate insulating film except under the gate electrodes to expose the main surface of the semiconductor substrate; forming an insulating film on the exposed main surface of the semiconductor substrate by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen combustion method, and a wet oxidation method performed at temperatures not lower than 950°C; and forming impurity diffused layers on both sides of the respective gate electrodes in the semiconductor substrate.

Page 6, lines 11-19, please replace the paragraph with the following text:

According to another aspect of the present invention, there is provided a semiconductor device manufacturing method comprising forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate; forming gate electrodes on the gate insulating film; making a nitrogen concentration of the gate insulating film except under the gate electrodes lower than a nitrogen concentration of the gate insulating film which lies under the gate electrodes by oxidizing the gate electrodes and the gate insulating

film by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen combustion method, and a wet oxidation method performed at temperatures not lower than 950°C; and forming impurity diffused layers on both sides of the respective gate electrodes in the semiconductor substrate.

Page 6, lines 20-28, please replace the paragraph with the following text:

According to still another aspect of the present invention, there is provided a semiconductor device manufacturing method comprising forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate; forming gate electrodes on the gate insulating film; forming a post oxidation film on the main surface of the semiconductor substrate except under the gate electrodes by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen combustion method, and a wet oxidation method performed at temperatures not lower than 950°C; oxynitrifying the post oxidation film, and forming impurity diffused layers on both sides of the respective gate electrodes in the semiconductor substrate.--

IN THE CLAIMS

--1. (Twice Amended) A semiconductor device manufacturing method comprising:
forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate;
forming gate electrodes on the gate insulating film;
removing the gate insulating film except under the gate electrodes to expose the main surface of the semiconductor substrate;
forming an insulating film on the exposed main surface of the semiconductor substrate by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen

combustion method, and a wet oxidation method performed at temperatures not lower than 950°C; and

forming impurity diffused layers on both sides of the respective gate electrodes in the semiconductor substrate.

10. (Three Times Amended) A semiconductor device manufacturing method comprising:

forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate;

forming gate electrodes on the gate insulating film;

making a nitrogen concentration of part of the gate insulating film except under the gate electrodes lower than a nitrogen concentration of part of the gate insulating film which lies under the gate electrodes by oxidizing the gate electrodes and the gate insulating film by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen combustion method, and a wet oxidation method performed at temperatures not lower than 950°C; and

forming impurity diffused layers on both sides of the respective gate electrodes in the semiconductor substrate.

12. (Twice Amended) A semiconductor device manufacturing method comprising:

forming a gate insulating film in an oxynitride form on a main surface of a semiconductor substrate;

forming gate electrodes on the gate insulating film;

forming a post oxidation film on the main surface of the semiconductor substrate except under the gate electrodes by at least one of a vaporizer method using H₂O as an oxidizer, an oxyhydrogen combustion method, and a wet oxidation method performed at temperatures not lower than 950°C;

oxynitrifying the post oxidation film; and
forming impurity diffused layers on both sides of the respective gate electrodes in the
semiconductor substrate.--